

*American Photographs of Total Solar Eclipse of August 7, 1869.*  
By Rev. T. W. Webb.

Through the courteous intervention of my valued correspondent W. S. Gilman, Jun. Esq. of New York (himself an accomplished observer of astronomical phenomena), I have been favoured by Professor Mayer, of Lehigh University, Pennsylvania, with some specimens of the photographs taken by him during the late total Solar Eclipse of August 7. As these were sent direct from America to Somerset House, I have not had an opportunity of seeing them; but, as I have every reason to believe that they will prove acceptable to the Society, I beg permission to forward to you the following explanatory statement, taken, with some abridgment, from Professor Mayer's letter to myself:—

“The Photographic Expedition, of which these photographs are some of the results, was organized by Prof. Henry Morton, Secretary of the Franklin Institute, Philadelphia, under the authority of Prof. I. H. C. Coffin, U.S.N., the Superintendent of our National Nautical Almanac. The expedition was divided into three parties, stationed respectively at Burlington, Mount Pleasant, and Ottumwa, in the State of Iowa. To me was assigned the organization and command of the station of Burlington, and the photographs I send were taken by me at that place.

Burlington, Iowa, is a town on the W. bank of the Mississippi River, situate in Lat. N.  $40^{\circ} 48' 21'' \cdot 58$ , Long.  $0^{\text{h}} 56^{\text{m}} 13^{\text{s}} \cdot 88$  W. of the Observatory at Washington. This station was about 7 miles N. of the centre of the Moon's shadow.

“The telescope, by Merz and Mähler, of 6.42 inches aperture and 9 feet focus, was equatorially mounted, and driven by one of Frauenhofer's friction-governor clocks. The Sun's image, 2.04 inches in diameter, was formed on the plate of the camera by a negative eye-piece specially calculated to give the least aberration. The image of a reticule of two spider-threads at right angles was also projected on the plate with the Sun's disk, and one of these lines was accurately adjusted to the celestial equator; and thus the photographs give precise position-angles of the contacts and of the protuberances.

“A plate having a slot of  $\frac{1}{50}$  inch in breadth shot across the eye-piece by the action of a spring for the exposure during partial phase. The duration of this *flash* of the Sun upon the camera-plate I have made the subject of experimental investigation; and I find it to have been almost exactly  $\frac{1}{500}$ th of a second. A 2-inch aperture of object-glass was used during partial phase work. During totality the full aperture was used, and a slide which allowed the whole beam to fall upon the plate; the exposures varying from 5 to 7 seconds.

“Forty-one perfect photographs were taken during the eclipse, and five of these (all of which I send) were taken during totality, which lasted with us  $2^{\text{m}} 42^{\text{s}}$ . I send nine plates taken at the

times I place opposite the numbers, which correspond with those on the plates.

	No.	Sidereal Time of Burlington.		
			<sup>h</sup>	<sup>m</sup> <sup>s</sup>
Before Totality	4 .. ..	13	2	4.1
	19 .. ..	13	49	39.8
	21 .. ..	13	58	32.4
Totality	23 (Exposure 5 <sup>s</sup> )	14	4	1.4
	24 ( .. 5 )	14	4	29.6
	25 ( .. 7 )	14	4	52.8
	26 ( .. 7 )	14	5	10.37
	27 ( .. 7 )	14	5	40.5
After Totality	35 .. ..	14	54	59.5

"The times were electrically recorded on a chronograph by the exposing plate breaking the electric circuit.

"The photograph numbered 4, taken 2<sup>s</sup>.8 after *observed* contact, shows a depression in the Sun's limb at the position of first contact, and from this depression shoots into the Sun a high lunar mountain, whose position, measured from the S. point of the cusps, is  $\frac{1}{4}$  of the distance to the N. point of the same.

"You will observe how beautifully defined are the two large spots in the S.W. and N.E. quadrants; the latter surrounded by well-developed faculæ, one of which seems to bridge over the spot and divide it into two portions. I also call attention to the gradation of shade from the border of the Sun inward, the faculæ, the mountains on the Moon's limb, and a glow like that of early dawn (also obtained in the photographs by Mr. De La Rue in 1860), which extends to 18" beyond the limb of the Moon.

"I could hardly have wished for better success during totality. I might probably have obtained more of the corona by longer exposures, but it would have been at the expense of the fine definition in the prominences, to which my work was specially directed.

"Will you have the courtesy, my dear Sir, to present to the Astronomical Society the nine photographs on glass taken from the original negatives with an orthoscopic lens: I wish them to be preserved in their collection. The other three enlarged copies on paper (also made with an orthoscopic lens) I wish you to receive as a present from me. The best way to examine the glass photographs is to incline them over a piece of white drawing paper placed before a north window, and use a lens magnifying about eight diameters."

Thus far, in substance, Professor Mayer, who has also kindly offered for the Society's acceptance a copy of his Report on the Eclipse, published in the Journal of the Franklin Institute, which contains many additional particulars of much interest. He has also presented to them a copy of his Lecture-Notes on Physics.

Hardwick Vicarage, Nov. 10, 1869.